

Warranty and Warranty Adjustment

Applicable to the Probeye Infrared Viewer and all original accessories thereto sold by the Industrial Products Division of Hughes Aircraft Company

1. This warranty shall apply to the PROBEYE Infrared Viewer and all original accessories manufactured by the Industrial Products Division of Hughes Aircraft Company.

2. For a period of one year after shipment by Seller, the product defined in paragraph 1 is warranted against defects in material and workmanship. Seller's obligations under this warranty shall be limited to repairing, replacing, subject to price adjustment, or refunding the adjusted price of any product determined by Seller to be defective in operation, workmanship or material and to have become so defective within one year after shipment by Seller.

3. Adjustments are limited to claims presented by Buyer in writing to Seller within thirty (30) days after Buyer first has reason to believe the product to be defective or the expiration of the warranty period.

4. Products believed by Buyer to be defective shall be returned to Seller, transportation and insurance prepaid by Buyer. Prior to such return, Buyer shall obtain transportation and packing instructions from Seller. Buyer's failure to obtain such instructions shall be a ground for refusal on the part of Seller to assume responsibility for transportation charges or for damage which may have occurred during return shipment subject to the foregoing qualification. Credit for return surface transportation and transit insurance costs within the United States will be issued by Seller, provided adjustment is allowed, on products subject to adjustment within 30 days after original shipment by Seller. All claims and correspondence should be addressed as follows:

HUGHES AIRCRAFT COMPANY
INDUSTRIAL PRODUCTS DIVISION
6855 El Camino Real
Carlsbad, California 92008
Attn: Image Devices Marketing

5. Adjustment will not be allowed for products which have been subjected to abuse, alteration, accident or negligence in use, storage, transportation or handling; nor for products from which original identification markings have been removed, defaced or altered; nor for argon cylinders which have been allowed to be completely evacuated, causing air or other contaminants to enter.

6. THIS WARRANTY IS VOID IF THE CASE COVER IS REMOVED FROM THE PROBEYE INFRARED VIEWER BY ANYONE OTHER THAN AN AUTHORIZED HUGHES TECH-

NICIAN. Impairment of operation may result to the Probeye Infrared Viewer from such unauthorized action.

7. Seller will notify Buyer of products not subject to adjustment; and promptly upon receiving such notice, Buyer will notify Seller as to whether the product should be repaired, returned to Buyer without repair or otherwise disposed of. For replaced items, Buyer will pay the established price for the item at time of replacement. For repairs, Buyer will pay Seller reasonable charges. Under all circumstances, Buyer will pay transportation charges.

8. Seller will make final determination as to the cause or existence of defect. To the extent that a product is determined to be subject to adjustment, Seller shall have the option to refund its price or promptly to repair or replace and return the product, without charge, to Buyer.

9. Replacements for products subject to adjustment within 30 days after original shipment by Seller will be shipped F.O.B. city of destination with surface transportation charges allowed by Seller to city of destination. However, if destination is beyond the limits of the United States, transportation beyond those limits will be charged to Buyer.

10. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE OF THE QUOTATION, SALES ORDER OR CONTRACT INCORPORATING THIS FORM OF WARRANTY. PRODUCTS FURNISHED TO BUYER'S DESIGN ARE NOT WARRANTED AS TO MERCHANTABILITY, or in any other respect except as to conformity with such design. Buyer's remedies for breach of warranty shall be limited to repair, replacement and full or partial adjustment of purchase price, as provided in paragraph 2 hereof. Seller shall not be liable for consequential damages. No attempt to change this warranty shall be binding on Seller unless it shall be by written agreement signed by a duly authorized representative of Seller.

11. Subject to the provisions of the Patent Indemnity clause of its sale terms and conditions, Seller also warrants that it has the right to sell its products, that Buyer shall have and enjoy quiet possession thereof as against any lawful claims existing at the time of sale by Seller, and that said products are free from any charge or encumbrance in favor of third persons existing at the time of sale by Seller.

probeyeTM

INFRARED VIEWER

INSTRUCTION

MANUAL

IMPORTANT:

Before placing PROBEYE[®] Infrared Viewer in service, refer to OPERATING INSTRUCTIONS, Section 2.

HUGHES

HUGHES AIRCRAFT COMPANY
INDUSTRIAL PRODUCTS DIVISION
IMAGE DEVICES
CARLSBAD, CALIFORNIA

TABLE OF CONTENTS

Section	Page
<i>Section 1—General Description</i>	
1.1 Scope of the Manual	5
1.2 Purpose and Features of the Equipment	5
1.3 Summary of Performance and Principal Characteristics	5
<i>Section 2—Operating Instructions</i>	
2.1 Receiving Inspection	6
2.2 Placing PROBEYE® Infrared Viewer in Operation	6
2.3 Securing PROBEYE® Infrared Viewer from Service	9
<i>Section 3—Operating Principles</i>	
3.1 Essential Elements	9
3.2 Functional Description	9
3.3 Control Functions	11
3.3.1 On-Off Switch	11
3.3.2 Brightness Control	11
3.3.3 Focus Control	11
<i>Section 4—Equipment Maintenance</i>	
4.1 General	11
4.2 Optics	11
4.3 Power Cell Recharging	12
4.4 Power Cell Voltage Check	12
4.4.1 Drive Motor Power Cell	12
4.4.2 Electronics Power Cell	12
4.5 Power Cell Replacement	12
4.6 Replacing the Argon Cylinder	13
4.7 Refilling the Argon Cylinder	13
4.8 Special Precautions with Gas Supply	13
<i>Section 5—Trouble-shooting Procedures</i>	
5.1 General	14
5.2 Trouble-shooting Chart	15

Illustrations

Figure	Page
1 PROBEYE® Infrared Viewer in Operation	4
2 PROBEYE® Infrared Viewer; Bottom View	7
3 PROBEYE® Infrared Viewer; Left Side View	8
4 PROBEYE® Infrared Viewer; Right Side View	8
5 PROBEYE® Infrared Viewer; Infrared Radiation and Visible Light Paths	10

Section 1 General Description

1.1 SCOPE OF THE MANUAL

This Instruction Manual for Hughes PROBEYE® Infrared Viewer* includes a description of the instrument, a summary of performance and principal characteristics, an outline of operating principles, operating instructions, maintenance information, and trouble shooting procedures.

*U.S. patent 3,626,091.

1.2 PURPOSE AND FEATURES OF THE EQUIPMENT

PROBEYE® Infrared Viewer is a highly sensitive, hand-held infrared imager which presents, in its observer's eyepiece, a detailed thermal picture of the entire scene within the field of view.

By clearly showing temperature differences between closely adjacent objects, and between objects and background, PROBEYE® Infrared Viewer quickly and accurately locates sources of fire and heat. And because it can do this in total darkness, and through smoke and haze, it is an invaluable aid to fire fighters and law enforcement officers, and to mine, utility, and industrial plant inspectors.

Operation of the PROBEYE® Infrared Viewer is based on the principle that all objects, whether animate or otherwise, radiate infrared energy in amounts depending on their temperatures. As the PROBEYE® Infrared Viewer scans a scene, it detects and converts the levels of infrared radiation to corresponding levels of visible light; in this way it produces, on a small viewing screen, a display containing easily distinguishable temperature patterns of all objects in range. The thermal picture presented is in red, to maintain its observer's night vision.

The PROBEYE® Infrared Viewer is comprised essentially of an optical system, scanning mechanism, an infrared detector and cryostat assembly, signal processing electronics, and a visual display. These elements, together with a power supply consisting of two rechargeable nickel-cadmium (NICAD) power cells, are housed in a cast aluminum, weather-resistant enclosure 6 in. high x 8 in. wide x 9 in. long, including eyepiece. Infrared detector cooling is done with argon, supplied by a small, high-pressure gas cylinder fastened to the enclosure underside by a stainless steel strap.

Weighing only 7.2 lb, complete, the PROBEYE® Infrared Viewer is conveniently portable and completely self contained; see Fig. 1. With fully-charged power cells and argon cylinder, the instrument can be operated continuously for about four hours.

1.3 SUMMARY OF PERFORMANCE AND PRINCIPAL CHARACTERISTICS

PERFORMANCE

Field of view	18° horizontal x 7.5° vertical
Horizontal and vertical resolution	0.12°
Frame rate	15 frames per second
Interlace factor	10
Running time, continuous, in moderate ambient	4 hours**
Temperature resolution	643 0.5°C, minimum
	649-650 0.1°C "

OPTICAL CHARACTERISTICS

Entrance pupil diameter	1 inch
-------------------------------	--------

** Running time decreases with increasing ambient temperature.



Figure 1
PROBEYE® Infrared Viewer in Operation.

Focal length 1.5 inches
 Spectral region 3 to 5.4 microns
 Apparent magnification Unity

DETECTOR CHARACTERISTICS

Detector type Photo-voltaic; indium-antimonide
 Number of elements 6
 Detector temperature -186°C
 Detector coolant Argon, a non-toxic, non-flammable inert gas

POWER EQUIPMENT

Two nickel-cadmium (NICAD) power cells 1.5 watts

MECHANICAL

Dimensions 6 in. high x 8 in. wide x 9 in. long (15.2 x 20.3 x 26.9 cm)
 Weight, including power cells and argon cylinder 7.2 lb (3.27 kg)

Section 2 Operating Instructions

2.1 RECEIVING INSPECTION

On receipt of the PROBEYE® Infrared Viewer, open the shipping container (or carrying case, if supplied), and carefully examine the contents for any evidence of damage in transit. In addition to the PROBEYE® Infrared Viewer, the shipment includes (1) two argon cylinders, (2) battery charger, and (3) safety strap.

CAUTION! Argon cylinders are furnished fully charged; do not rotate the valve knob on a cylinder (Fig. 2) until it has been fitted to the instrument as in Sec. 2.2, Steps A and B, below. Also, it is recommended practice to allow the infrared detector to cool to operating temperature before turning the ON-OFF switch ON.

2.2 PLACING PROBEYE® INFRARED VIEWER IN OPERATION

A. Remove the instrument from its container and place it upside down on a padded surface. Unfasten the stainless steel strap latch; see Fig. 2. Place a fully-charged argon cylinder in the frame; align the cylinder so that the gas discharge fitting can be engaged with the 9/16-inch coupling nut, and take up the coupling nut finger tight.

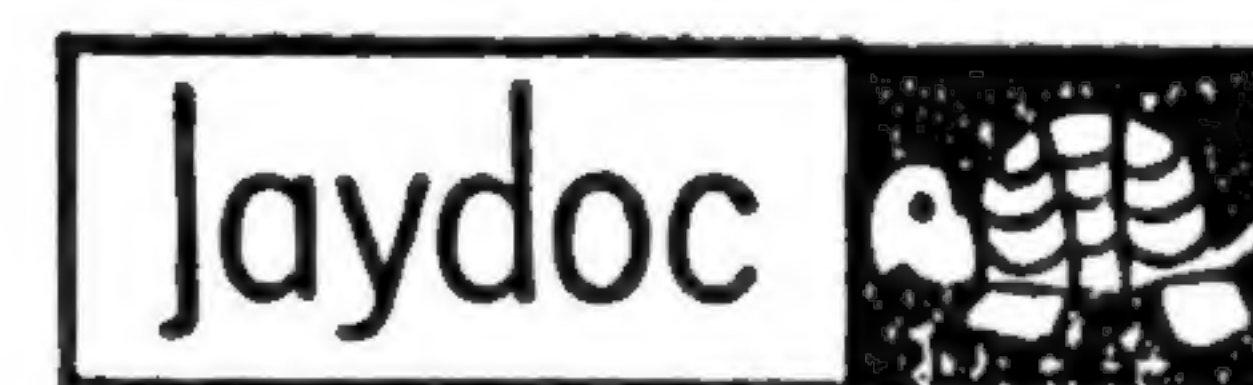
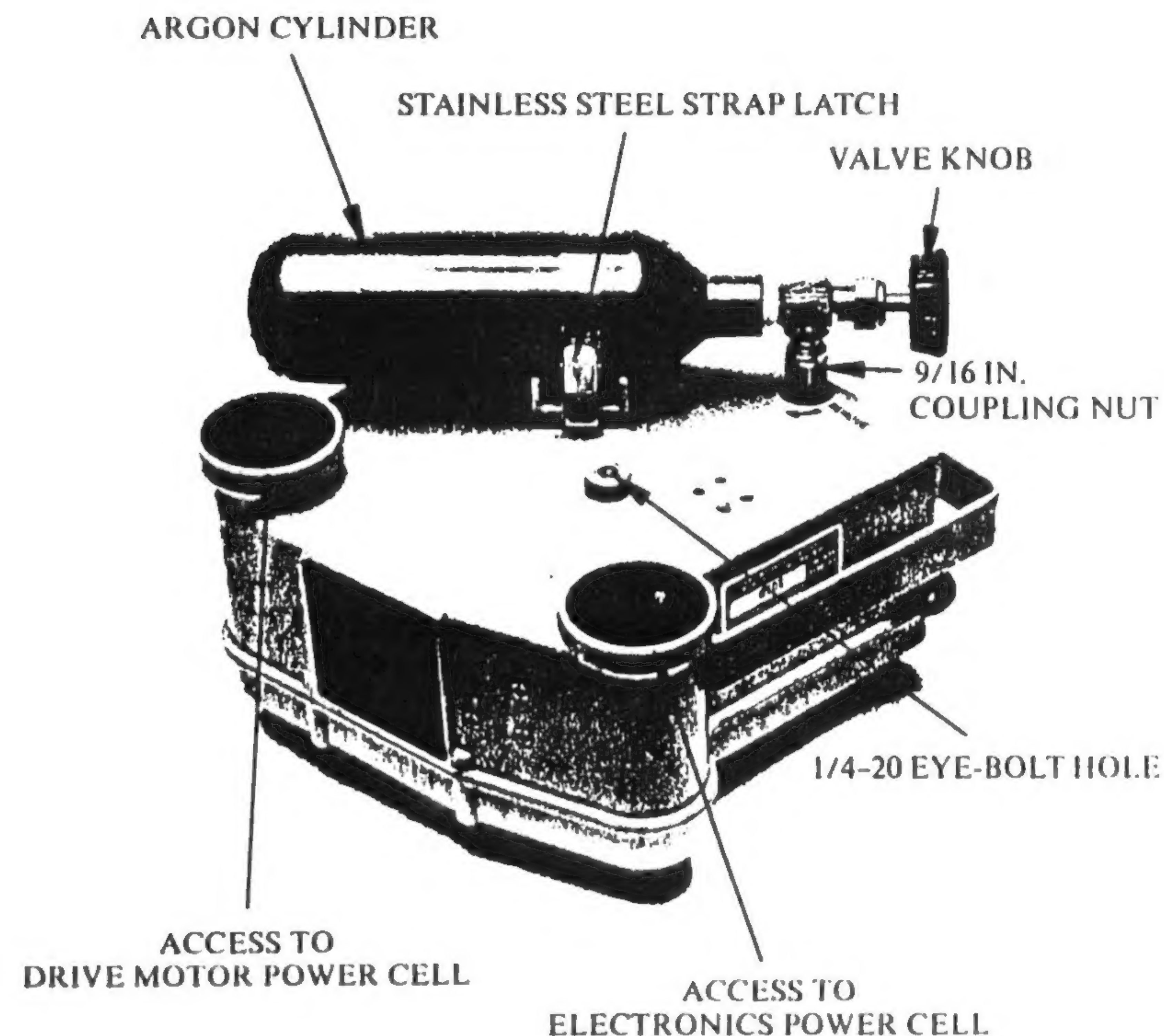
B. Latch the stainless steel strap around the argon cylinder. Using a 9/16-inch open-end wrench, tighten the coupling nut snugly.

CAUTION! Don't use excessive torque; this will distort the pressure seal.

C. If the safety strap is to be used, thread the eye-bolt into the 1/4-20 hole, and tighten securely.

D. Open the gas valve by turning the valve knob at least one full turn counterclockwise. A hissing sound of gas transfer from the argon cylinder should be heard, and should continue for about 30 seconds as the infrared detector cools to proper operating temperature.

IMPORTANT! To assure that the gas supply is sufficient for four full hours of continuous operation, keep the gas valve open during the entire operating period, unless the PROBEYE® Infrared Viewer is expected to remain idle for 20 or more minutes. Otherwise, repeated opening and closing of the valve wastes appreciable gas in recooling the detector.



Infrared Sales & Service Division
 2201 Royal Anne Drive
 Coeur d'Alene, Idaho 83814
 Phone 208/667-9739

FIGURE 2
 PROBEYE® Infrared Viewer; bottom view.

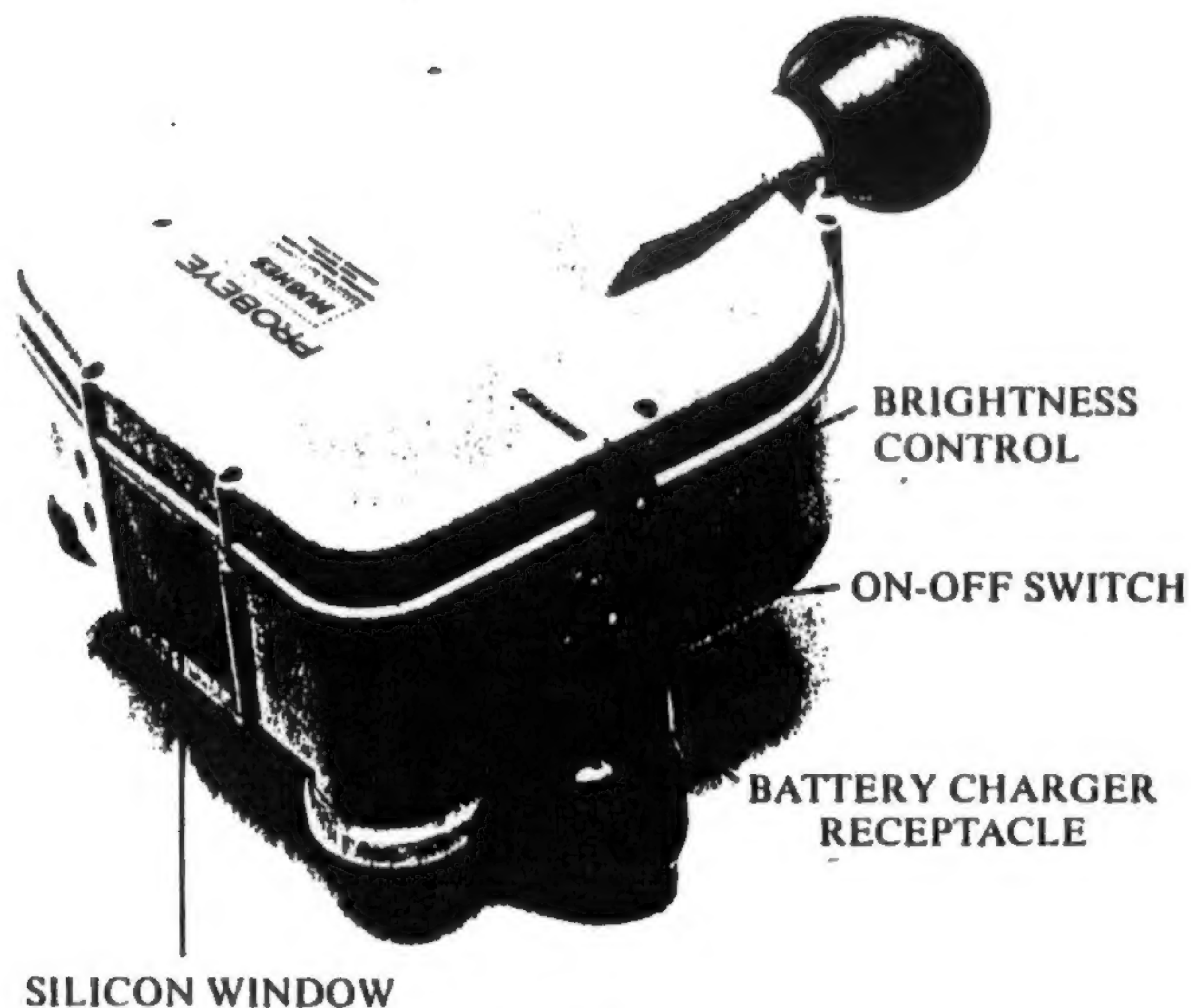


FIGURE 3
PROBEYE® Infrared Viewer; left side view.

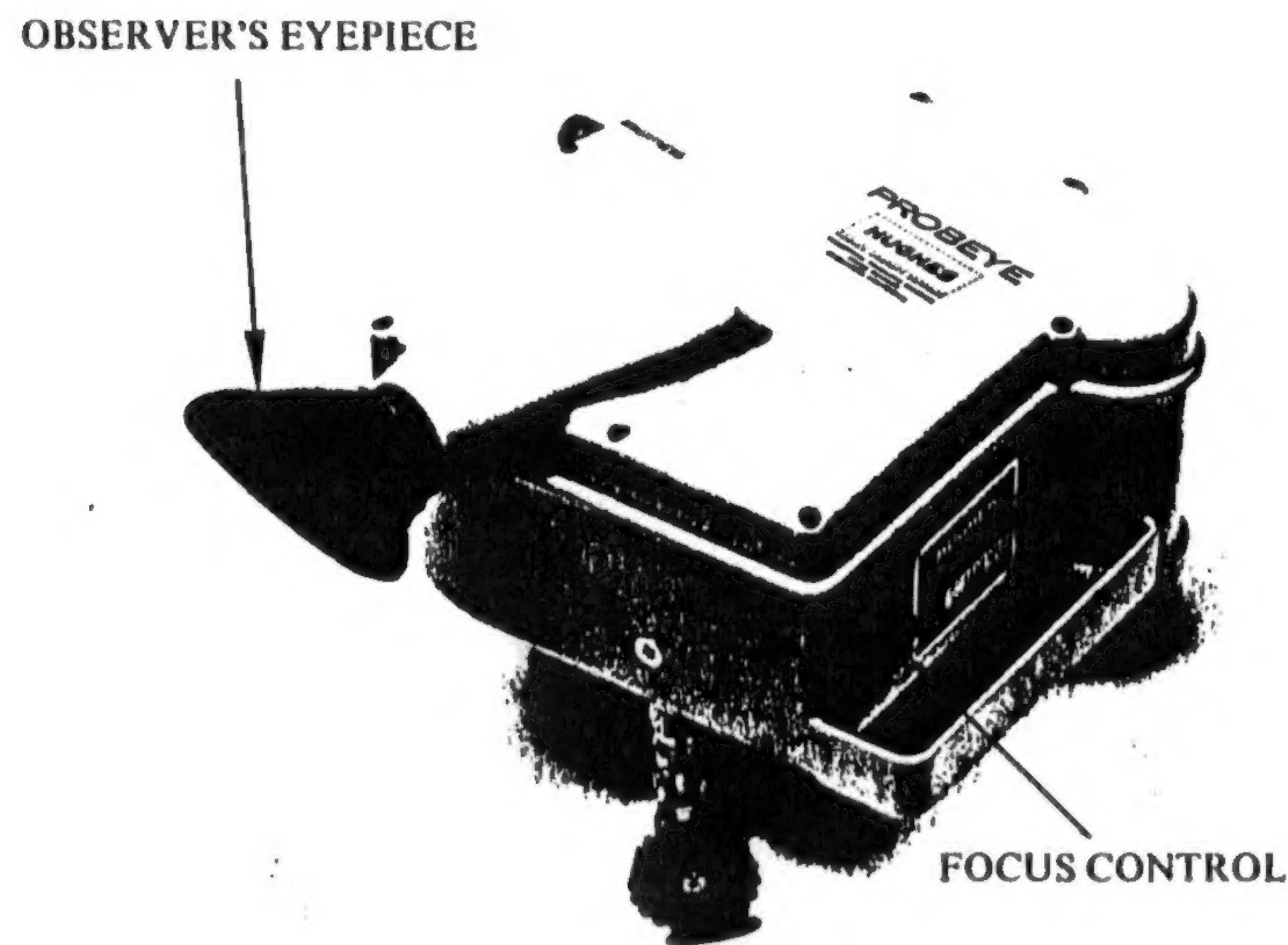


FIGURE 4
PROBEYE® Infrared Viewer; right side view.

- E. When the detector has fully cooled, turn the ON-OFF switch to the ON position (Fig. 3).
- F. Place the PROBEYE® Infrared Viewer in the operating position, as in Fig. 1, and observe the thermal image in the eyepiece.
- G. Adjust the BRIGHTNESS control (Fig. 3) to the desired level; smaller temperature differences are resolved as this control is rotated clockwise.
- H. Adjust the FOCUS control on the right side of the housing (Fig. 4), for the sharpest possible thermal image.

NOTE: If the picture is lost during the course of operation, it is likely due to gas pressure having fallen below the proper level. In this event, replace the argon cylinder according to the procedure outlined in Sec. 4.5.

2.3 SECURING THE PROBEYE® INFRARED VIEWER FROM SERVICE

At the end of the operating period, turn the instrument off in this sequence:

- A. Turn the ON-OFF switch to the OFF position.
- B. Shut off the gas supply by turning the valve knob clockwise until the valve is snugly seated.

CAUTION: Do not apply excessive torque to the valve knob, since the seal may be damaged, causing gas to leak.

WARNING! At all times that PROBEYE® Infrared Viewer is stored, be sure that the gas valve is closed; this is particularly important when the gas supply is nearly expended, as after a normal operating period.

Never allow the argon cylinder to become completely exhausted; to do so permits entry of air, together with moisture, which may oxidize the interior of the cylinder. Special treatment is then required before refilling. Attention is directed to Sec. 4.7, "Special Precautions with Gas Supply."

Section 3 Operating Principles

3.1 ESSENTIAL ELEMENTS

Hughes PROBEYE® Infrared Viewer, shown in Fig. 1, is a hand-held thermal imaging instrument which provides a surveillance capability in total darkness, without need for target illumination of any kind.

The essential elements of PROBEYE® Infrared Viewer, housed within a cast-aluminum enclosure, are an optical system, scanning mechanism, a detector-cryostat assembly, signal processing electronics and the visual display.

A collimated beam scanning technique is used to optomechanically scan an 18° horizontal by 7.5° vertical field of view, with 10:1 interlace. An array of linear infrared detectors, cooled to -186°C, converts the infrared radiation received by the optical system into electrical signals. After amplification and processing, these signals produce visible images that are reconstructions of the infrared patterns in the scene. Power for operating PROBEYE® Infrared Viewer is supplied by NICAD power cells contained within the enclosure; provision is made for power cell recharging by means of an external connector. Detector coolant, cryostat controlled, is supplied by a refillable argon cylinder attached to the bottom of the enclosure.

3.2 FUNCTIONAL DESCRIPTION

The operation of PROBEYE® Infrared Viewer can best be visualized by referring to the simplified drawing of Fig. 5.

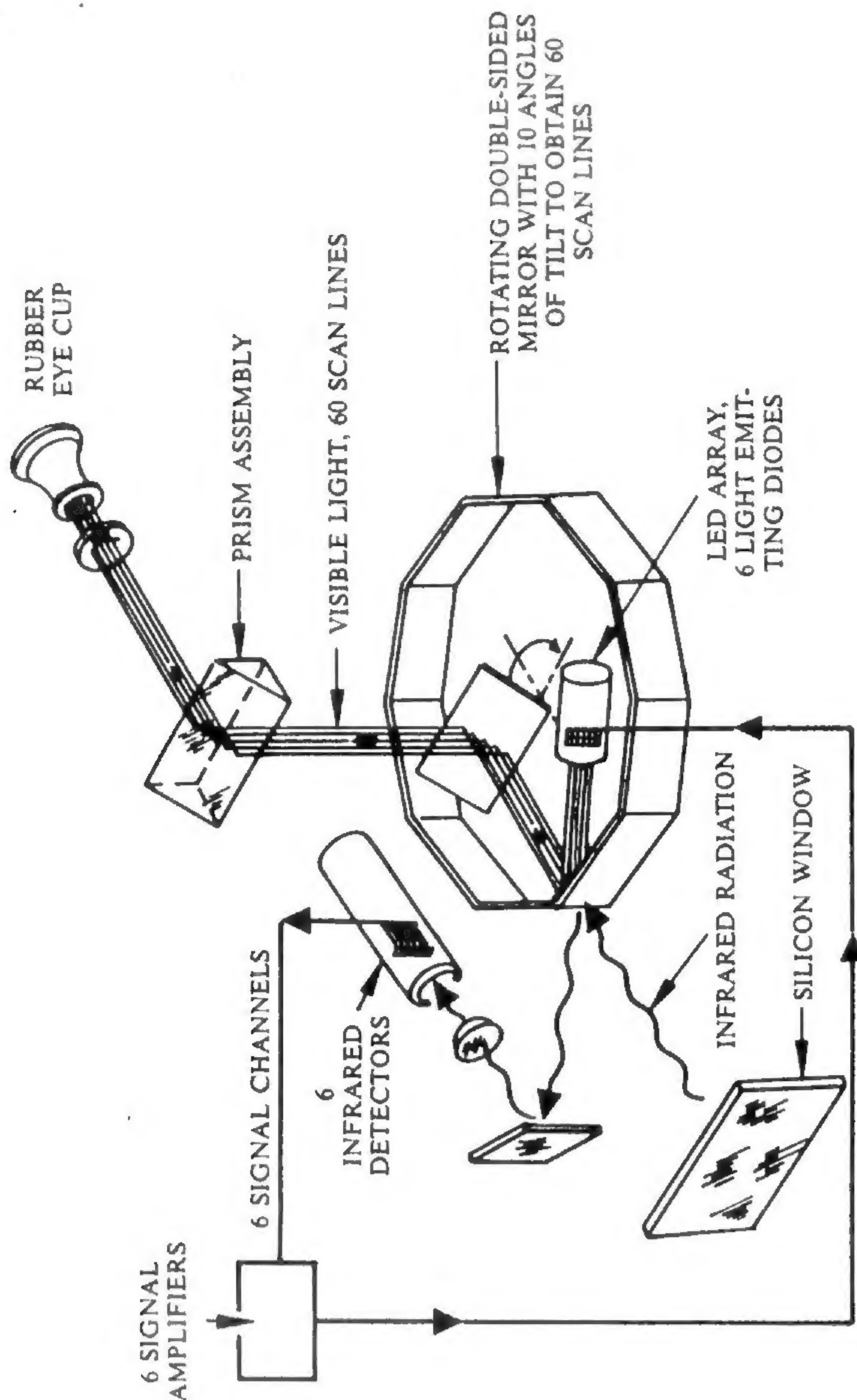


FIGURE 5
PROBEYE® Infrared Viewer;
Infrared Radiation and Visible Light Paths.

Infrared radiation entering the silicon window is scanned by rotation of the 10-sided prismatic mirror, then directed through the infrared telescope to the six-element detector array. The detector array is mounted within the detector-cryostat assembly.

A raster-scanned, direct-view display in real time is provided by rotation of the 10-sided mirror, which is arranged so that both the inner and outer faces are at equal angles with respect to the axis of rotation, and adjacent faces are tilted slightly with respect to one another. By means of the six-element detector, and the slightly different orientation of each of the ten mirror faces, 60 scan lines are produced; and, since rotation occurs about the axis of symmetry, all scan lines are generated in the same direction.

Outputs of the detector elements are electrical signals whose amplitudes are proportional to the infrared power collected from the scene. These signals are amplified, and are used to modulate a six-element light-emitting diode (LED) array, positioned in such a manner as to appear coincident with the detector array. Light outputs of the LEDs, varying in correspondence with the radiance of the infrared scene, are then relayed to the observer's eye via the back surface of the prismatic mirror.

This causes the LED array to appear to scan unidirectionally just as the field of view of the detector array is scanning the infrared scene. Because of the rate used, this scanning of the modulated LEDs provides a 2-dimensional, time-varied image that is a reconstruction of the 2-dimensional infrared pattern in the scene.

3.3 CONTROL FUNCTIONS

3.3.1 ON-OFF SWITCH

The ON-OFF switch connects and disconnects the power cells to the scanning drive motor and the electronics in the PROBEYE® Infrared Viewer.

3.3.2 BRIGHTNESS CONTROL

The BRIGHTNESS control adjusts the overall brightness and temperature sensitivity of the display. It determines what temperatures in the infrared scene correspond to particular light levels in the visible display.

3.3.3 FOCUS CONTROL

The FOCUS control has a mechanical linkage, which adjusts the focal length of the infrared telescope; the effect of FOCUS adjustment is to sharpen the visible image in the observer's eyepiece.

Section 4

Equipment Maintenance

4.1 GENERAL

When not in use, PROBEYE® Infrared Viewer should be stored out of the weather and at room temperature, preferably in its own container, or carrying case if provided. In storage, the ON-OFF switch must be OFF to prevent discharging the power cells, and the valve knob on the argon cylinder must be securely closed.

4.2 OPTICS

Under normal operating conditions, dirt accumulates on the silicon window, and on the lens in the observer's eyepiece. These optics are coated, therefore only lens tissue, or a soft, lint-free cloth are recommended for cleaning. Where necessary, dampen the cloth in warm water, and use mild soap. The rubber eye cup is removable for access to the lens in the observer's eyepiece.

IMPORTANT! Be very careful to avoid scratching the optics, as this can seriously degrade the visual display.

4.3 POWER CELL RECHARGING

To recharge the self-contained NICAD power cells, proceed as follows:

- A. Check that the ON-OFF switch is OFF; otherwise, the power cells cannot charge. Also be sure that the valve knob on the argon cylinder is securely closed.
- B. Insert the 7-pin plug from the battery charger into the mating receptacle on the left side of the housing; see Fig. 3.
- C. Plug the charger power cord into a 117 Vac outlet.

NOTE: For the maximum 4-hour continuous operating time, a 16-hour charge period is recommended; however, *under no circumstances should the power cells remain on charge for more than 40 hours.*

Fully-charged power cells, even though unused, lose about 25% of their capacity per month at room temperature; therefore, the cells should be brought up to full charge prior to placing PROBEYE® Infrared Viewer in service.

4.4 POWER CELL VOLTAGE CHECK

The instrument uses two NICAD power cells; the larger cell powers the scanning drive motor, and the smaller powers the electronic circuitry. Location of the power cells is pointed out in Fig. 2. To remove either cell from the case:

- A. Carefully pry the holding ring from its ridge with a small screwdriver, and remove the holding ring.
- B. Turn the instrument over and allow the holding disc, and the power cell, to drop into the hand; don't allow the cell to drop so far that strain is placed on the leads. Do not disconnect the 3-pin plug and receptacle.

NOTICE: This is the *only* permissible access to the PROBEYE® Infrared Viewer enclosure; to open the case in any other way voids the Warranty. Refer to Paragraph 6 of the "Warranty and Warranty Adjustment," which appears on the inside front cover of this manual.

- C. Voltage readings are meaningful only if taken while PROBEYE® Infrared Viewer is in full operation. Open the gas valve at least one full turn counter-clockwise; then, after the detector has cooled, turn the ON-OFF switch ON.

4.4.1 DRIVE MOTOR POWER CELL

- A. Use an accurate dc voltmeter with 100,000 ohms per volt sensitivity or better. Set the meter to a low range, for example, 0-15 Vdc.
- B. Place the positive (usually red) probe of the meter to that end of the power cell from which the leads to the plug and receptacle emerge; place the negative probe of the meter (usually black) on the opposite end of the cell. The voltage reading should be not less than 9.6 Vdc.

4.4.2 ELECTRONICS POWER CELL

- A. Use exactly the same procedure as outlined for the drive motor power cell in Sec. 4.4.1, above. The voltage reading for this cell should also be not less than 9.6 Vdc.
- B. At the end of the voltage checks, turn the ON-OFF switch to OFF; then shut off the gas supply by turning the valve knob clockwise until the valve is snugly seated.

4.5 POWER CELL REPLACEMENT

The larger NICAD power cell operates the drive motor, and the smaller powers the electronic circuitry; location of the power cells is shown in Fig. 2. To replace either cell, proceed as follows:

- A. Gently pry the holding ring from its ridge with a small screwdriver, and remove the holding ring.
- B. Turn the instrument over and allow the holding disc, and the power cell, to drop

into the hand; do not allow the cell to drop so far that strain is placed on the leads.

- C. Disconnect the 3-pin plug from its receptacle.
 - D. Connect the 3-pin plug into the receptacle of the replacement power cell; push the cell carefully into the case.
 - E. Install the holding disc, then snap the holding ring in place.
- See the NOTICE on Page 12.

4.6 REPLACING THE ARGON CYLINDER

- A. Place PROBEYE® Infrared Viewer upside down on a padded surface; see Fig. 2. Check that the valve knob is turned fully clockwise.
- B. Use a 9/16-inch open-end wrench to loosen the coupling nut; the direction of rotation is indicated on the housing. As soon as the nut is loose, turn it by hand until it is disengaged from the threads on the valve.
- C. Unfasten the latch on the stainless steel strap; remove the expended argon cylinder, and replace with a fresh one.
- D. Align the cylinder so that the gas discharge fitting can be engaged with the 9/16-inch coupling nut, and take up the coupling nut finger tight.
- E. Fasten the latch on the stainless steel strap to secure the argon cylinder; with the wrench, tighten the coupling nut snugly.

CAUTION! Don't use excessive torque; this will distort the pressure seal.

4.7 REFILLING THE ARGON CYLINDER*

- A. PROBEYE® Infrared Viewer requires *dry* argon gas of "pre-purified," grade, 99.998% pure or better.
- B. Connect the argon cylinder to the recharging source. Open the valve, and set the charging rate so that the cylinder fills to a MAXIMUM of 5000 lb/sq. in. in not less than 2½ minutes; adjust the rate to prevent the cylinder from becoming too hot to touch.

WARNING! DO NOT fill the cylinder in a single, fast charge; this is an exceedingly dangerous practice, since it may lead to pressure failure of the gas line or fittings.

Information on the safe handling and use of gas cylinders is available from the Compressed Gas Association, 500 Fifth Ave., New York, NY 10036.

**Sources of supply for booster pumps suitable for refilling argon cylinders, and for argon gas of the required purity, are listed on page 17.*

4.8 SPECIAL PRECAUTIONS WITH GAS SUPPLY

If it is discovered that the gas valve has been left open, and the argon supply is exhausted, DO NOT refill the cylinder without taking corrective action as outlined below. Otherwise, the water vapor trapped in the cylinder can cause the cooling system to clog or freeze.

Place the exhausted argon cylinder, with the valve open, on a vacuum pump, and evacuate the cylinder for not less than 30 minutes; close the valve before removing the cylinder from the pump. Refill the cylinder according to the procedure in Sec. 4.6, Step B.

Vacuum pumps are normally available locally, for example, in the physics departments of high schools and colleges; however, if none can be obtained, contaminated argon cylinders must be returned to the factory for reconditioning and refilling.

Section 5 Trouble-shooting Procedures

5.1 GENERAL

The symptoms listed in the Trouble-shooting Chart in Sec. 5.2 are those most likely to be encountered in normal use. Except for power cell checks made in accordance with Sec. 4.4, corrective actions suggested for the various symptoms *do not* require access to the interior of PROBEYE® Infrared Viewer or its battery charger. If the corrective action suggested is not effective, contact the factory for repair service; refer to "Warranty and Warranty Adjustment," Paragraphs 4 and 5.

IMPORTANT! Internal repairs on PROBEYE® Infrared Viewer and associated equipment are to be made *only* by authorized Hughes Aircraft Company technicians. Opening the case voids the warranty; refer to "Warranty and Warranty Adjustment," Paragraph 6.



5.2 TROUBLE-SHOOTING CHART

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
1. No gas hiss* when the valve is opened.	Insufficient pressure in the argon cylinder. Internal gas line, or cryostat frozen or clogged	Replace the argon cylinder. If frozen, thaw for about 1 hour at room temperature. If clogged, try to free clogging by opening and closing the valve several times; if this fails, factory service is required.**
2. Gas hiss does not stop.	Gas pressure too low. Loose fittings, or break in the gas line.	Recharge the argon cylinder. Inspect gas line and fittings; tighten or repair as necessary.
3. Coupling nut will not engage, or thread onto argon cylinder fitting.	Damaged threads on nut or on fittings.	If threads on the fittings are damaged, rethread with 7/16-20 die, or replace fitting; if nut threads are damaged, factory service is required.
4. Instrument inoperative; no red screen and no motor sound.	Power cells discharged. Power cells disconnected.	Replace power cells. Check that mating connectors are fully engaged.
5. Red screen and motor sound, but no picture.	Defective mating connectors. Low gas pressure.	Reconnect broken lead(s). Replace argon cylinder.
6. Motor sound, but no red screen.	Electronics power cell discharged. Electronics power cell disconnected. Defective mating connectors.	Replace electronics power cell. Check that mating connectors are fully engaged. Reconnect broken leads(s).

*The term "hiss" refers to the sound of gas transfer heard at the eyepiece when the valve is opened, and continuing about 30 seconds until the cryostat cools.
**Be certain to use only dry, pure argon; see Sec. 4.6, Step A.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
7. Picture brightness fades; sides of screen become irregular or elongated.	Low power cells.	Recharge low power cells.
8. Red screen, but no motor sound.	Defective power cells.	Replace power cells.
	Drive motor power cell discharged.	Replace drive motor power cell.
	Drive motor power cell disconnected.	Check that mating connectors are fully engaged.
	Defective mating connectors.	Reconnect broken lead(s).
9. Argon supply does not last four hours	Gas leak in system.	Inspect gas line and fittings; tighten or replace as necessary. See Page 15, item 3.
	Internal gas line or cryostat is clogged.	Try to free clogging by opening and closing the valve several times; if this fails, factory service is required.
	Valve has been opened and closed too often during the operating period.	Refer to the note immediately following Sec. 2.2, Step D.
	Argon cylinder not filled to capacity.	Refill the argon cylinder; refer to Sec. 4.6.
	Instrument has been operating in very hot environment over long periods; see footnote, Page 5.	Not a malfunction, but occurs because hot environments require more gas for cryostat cooling.

BOOSTER PUMP AND ARGON GAS SUPPLIERS

Among the several manufacturers of booster pumps, the following are known to produce models suitable for filling the argon gas cylinders of PROBEYE[®] Infrared Viewer:

Haskel Engineering & Supply Co.

100 E. Graham Place

Burbank, CA 91502

SafetyAmp Pure Argon Boosters, Models 28525, 27826, 28655, and 28787.

American Instrument Company

Div. of Travenol Laboratories, Inc.

8030 Georgia Ave.

Silver Spring, MD 20910

Diaphragm-Type Compressors, Catalog no's J46-13310, J46-13411, J46-14025, and NPN.

The following is a partial listing of sources for pure argon gas; information on local distributors may be obtained by contacting these companies at the addresses indicated:

Airco Industrial Gases,

Div. Airco, Inc.

575 Mountain Ave.

Murray Hill, NJ 07974

Air Products and Chemicals, Inc.

Industrial Gas Div.

P. O. Box 538T

Allentown, PA 18105

Industrial Air Products Co.

3210 N. W. Yeon Ave.

Portland, OR 97210

Liquid Air, Inc.

12th Floor, 1 Embarcadero Ctr.

San Francisco, CA 94111

Liquid Carbonic Corp.

Sub. of Houston Natural Gas

Dept. TR, 135 So. LaSalle St.

Chicago, IL 60603

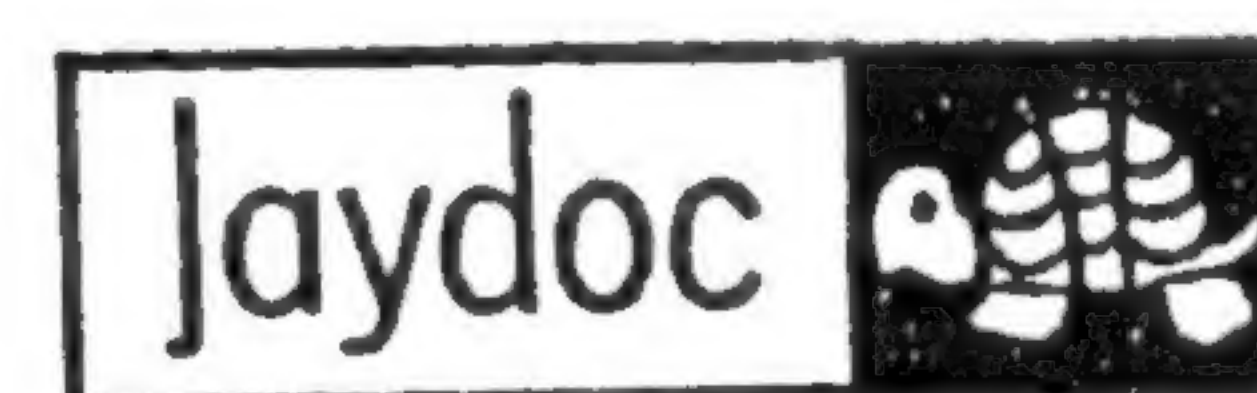
Union Carbide Corp.,

Linde Division

270 Park Ave.

New York, NY 10017

For a complete listing of argon gas suppliers, refer to THOMAS REGISTER, 1974, Vol. 2, Page 3529.



Infrared Sales & Service Division

2201 Royal Anne Drive

Coeur d'Alene, Idaho 83814

Phone 208/687-9739

THERE IS
NO
PAGE 18

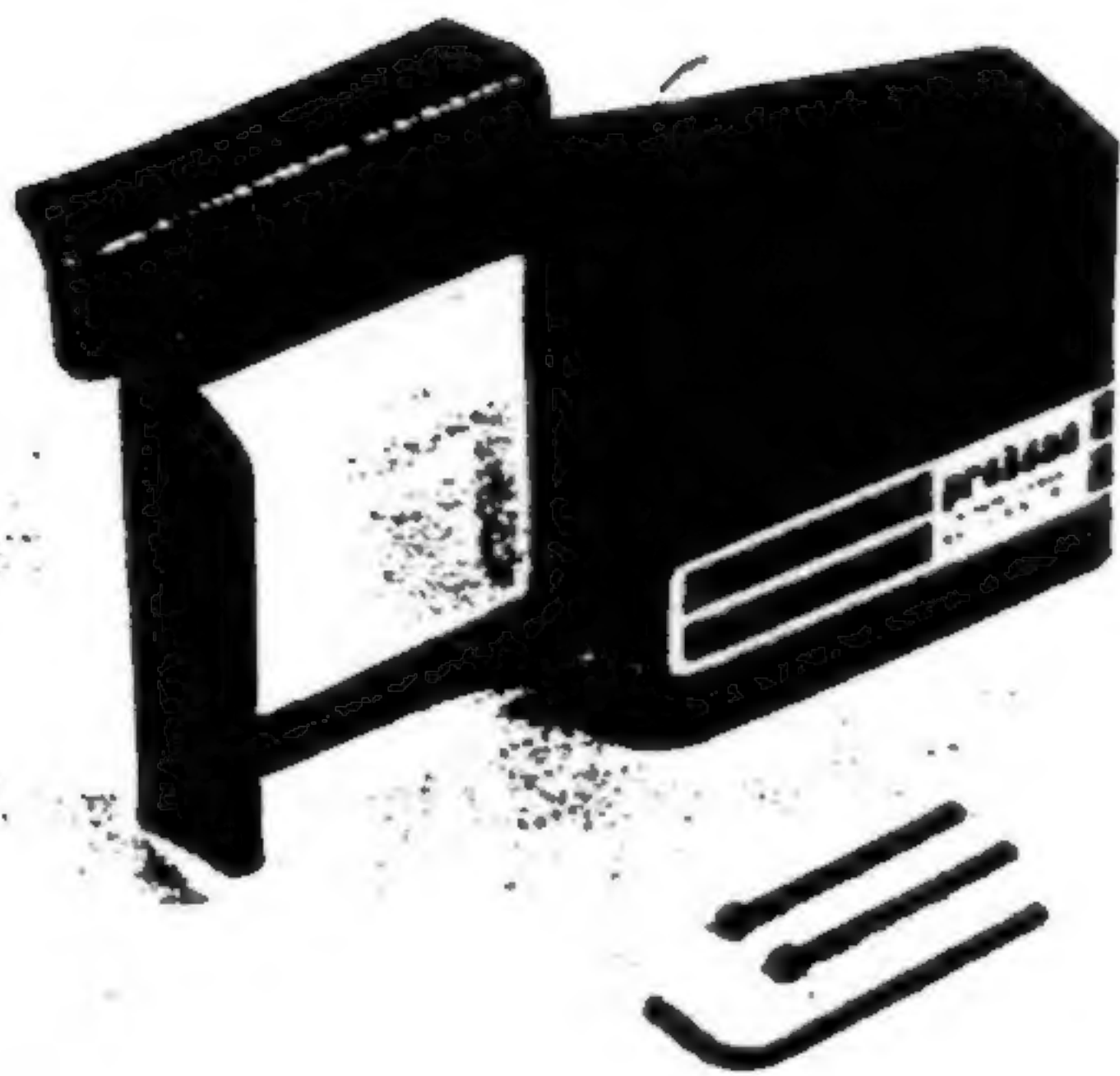


Figure 7
IR Filter Assembly



Section 6

ACCESSORIES

6.1 IR FILTER ASSEMBLY

The filter assembly is designed to provide increased capability of the PROBEYE Infrared Viewer by allowing it to be used to view objects of higher temperature which normally saturate the detectors. By inserting the filters, the infrared energy is attenuated and scenes of higher temperature can be viewed.

A. The assembly is mounted on the front of the unit. Remove existing Allen screws on either side of the front IR window with wrench provided (see Figure 7).

B. Mount unit using either two 1 $\frac{1}{8}$ -inch or 1 $\frac{1}{2}$ -inch long 4-40 Allen screws, depending on which housing the user has. Screws are furnished with assembly.

C. The "L" bracket provided with the assembly is universal to whichever housing the user has. If the assembly partially covers the IR window, loosen the two slotted screws and adjust filter assembly up or down to allow proper framing of IR window. The IR window will now be unobstructed.

D. To operate the assembly, insert appropriate number of filters to view objects at higher temperature. The temperature limits are given in the following chart with Brightness control set at mid-position.

Number of Filters

Approximate Viewing Temperature

	Contrast Control Fully Counterclockwise	Contrast Control Mid-Position
0	100°C (212°F)	60°C (140°F)
1	200°C (392°F)	150°C (302°F)
2	400°C (752°F)	250°C (482°F)
3	550°C (1022°F)	350°C (662°F)
4	650°C (1200°F)	450°C (842°F)
5	700°C (1292°F)	500°C (932°F)
6	725°C (1337°F)	525°C (977°F)

These temperatures represent the limits of viewing an object indoors when the background is at room temperature. The picture may be affected by other factors such as background temperature, humidity, distance, viewing in direct sunlight, etc. The readings are a close approximation; they should not be used as absolute data.

6.2 DC TO DC CHARGING ADAPTER

CAUTION!

INSTALL IN VEHICLE WITH 12 Vdc NEGATIVE GROUND SYSTEM ONLY.

- Insert black plastic connector into vehicle cigarette lighter socket.
- Insert blue connector into the PROBEYE Infrared Viewer battery charger socket.
- When vehicle engine is not running, charging time is the same as the ac battery charger, i.e., 16 hours or four hours for every hour used. With vehicle engine running, charging time is half as much.

6.3 EXTERNAL CHARGING ADAPTER

- Insert battery charger plug into mating receptacle of adapter.
- Connect batteries to adapter. Insert two-wire socket (red and black) to two-wire receptacle of battery, and three-wire socket (red, white, and black) to three-wire receptacle of battery (see Figure 6).
- Charge both batteries simultaneously.

6.4 UNIVERSAL CHARGING ADAPTER

The Universal Charging Adapter allows the user to charge the PROBEYE Infrared Viewer in countries where the line voltage is not 115 Vac, 60 Hz.

- Determine the ac line voltage available.
- Set switch to appropriate position:

VOLTAGE RANGE Vac @ 50/60 Hz

SWITCH SETTING

95 to 105

100 Vac

105 to 120

115 Vac

220 to 240

230 Vac

- Add appropriate (user provided) wall connector to power cord:

White wire to ac primary

Black wire to ac return

Green wire to ground

- Insert universal charger adapter into wall connector. Insert battery charger into adapter socket and follow battery charging procedure in Section 4.3.